

Swift Observations of GRB 121217A

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1. Introduction

Siegel *et al.* (GCN Circ. 14089) reported the initial Swift results. At 07:17:47 UT, the Swift Burst Alert Telescope (BAT) triggered and located GRB 121217A (trigger=542441). Swift slewed immediately to the burst. **Table 1** contains the best reported positions from Swift. The latest XRT position can be viewed at http://www.swift.ac.uk/xrt_positions.

Oates and Siegel (GCN Circ. 14092) reported the detection with UVOT of an optical afterglow. Elliott *et al.* (GCN Circ. 14091) reported the position from GROND for the optical afterglow of this GRB. Ruffini *et al.* (GCN Circ. 14095) reported a redshift of 0.8. **Table 2** is a summary of GCN Circulars about this GRB from observatories other than Swift.

Standard analysis products for this burst are available at http://gcn.gsfc.nasa.gov/swift_gnd_ana.html.

2. BAT Observations and Analysis

Analysis of the BAT data was reported by Cummings *et al.* (GCN Circ. 14096). The BAT ground-calculated position is RA, Dec = 153.708, -62.354 deg, which is RA(J2000) = 10h 14m 50.0s Dec(J2000) = -62d 21' 15.5" with an uncertainty of 1.0 arcmin, (radius, sys+stat, 90% containment). The partial coding was 99%.

The mask-weighted light curve (**Figure 1**) shows two well-separated periods of emission. The first starts at $\sim T-110$ s with weak emission, then peaks at $\sim T+1$ s, and returns to baseline at $\sim T+80$ s. The second period of emission starts at $\sim T+500$ s, with weak peaks at $\sim T+500$ and $\sim T+610$ s and the main peak at $\sim T+730$ s and returns to baseline out past $T+960$ s (where the data ends). There are enough differences in the profiles of these two periods of emission to conclude they are not gravitationally lensed. $T_{90}(15-350 \text{ keV})$ is 778 ± 16 s (estimated error including systematics).

The time-averaged spectrum from $T-17.7$ to $T+783.8$ s is best fit by a simple power-law model. The power law index of the time-averaged spectrum is 1.53 ± 0.08 . The fluence in the 15-150 keV band is $6.2 \pm 0.3 \times 10^{-6} \text{ erg cm}^{-2}$. The 1-s peak photon flux measured from $T+735.96$ s in the 15-150 keV band is $1.8 \pm 0.1 \text{ ph cm}^{-2} \text{ s}^{-1}$. All the quoted errors are at the 90% confidence level.

The results of the batgrbproduct analysis are available at http://gcn.gsfc.nasa.gov/notices_s/542441/BA/.

3. XRT Observations and Analysis

Analysis of the XRT data was reported by Evans *et al.* (GCN Circ. 14093). We have analysed 97 ks of XRT data for GRB 121217A, from 70 s to 1.3 Ms after the BAT trigger. The data comprise 655 s in Windowed Timing (WT) mode with the remainder in Photon Counting (PC) mode.

The initial decay was at an $\alpha=2.75 \pm 0.25$. This broke at T_0+164 s to a decay of $\alpha=0.54 (+0.05, -0.17)$. The late-time light curve (**Figure 2**) (from T_0+26 ks) can be modelled with a power-law decay with a decay index of $\alpha=1.38 \pm 0.08$.

A spectrum formed from the WT mode data can be fitted with an absorbed power-law with a photon spectral index of 2.15 (+0.11, -0.08). The best-fitting absorption column is consistent with the Galactic value of $3.7 \times 10^{21} \text{ cm}^{-2}$ (Kalberla *et al.* 2005). The PC mode spectrum has a photon index of 1.92 (+0.11, -0.10) and a best-fitting absorption column of $4.02 (+0.51, -0.30) \times 10^{21} \text{ cm}^{-2}$. The counts to observed (unabsorbed) 0.3-10 keV flux conversion factor deduced from this spectrum is $4.6 \times 10^{-11} (7.3 \times 10^{-11}) \text{ erg cm}^{-2} \text{ count}^{-1}$.

The results of the XRT team automatic analysis are available at http://www.swift.ac.uk/xrt_products/00542441.

4. UVOT Observations and Analysis

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Analysis of the UVOT data was reported by Oates and Siegel (GCN Circ. 14092). The Swift/UVOT began settled observations of the field of GRB 121217A 73 s after the BAT trigger. A source consistent with the GROND optical position (Elliott et al. GCN Circ. 14091) is detected in the initial UVOT exposures. **Table 3** gives preliminary magnitudes using the UVOT photometric system (Breeveld *et al.* 2011, AIP Conf. Proc., 1358, 373). No correction has been made for the expected extinction in the Milky Way corresponding to a reddening of E_{B-V} of 0.37 mag. in the direction of the GRB (Schlegel *et al.* 1998).

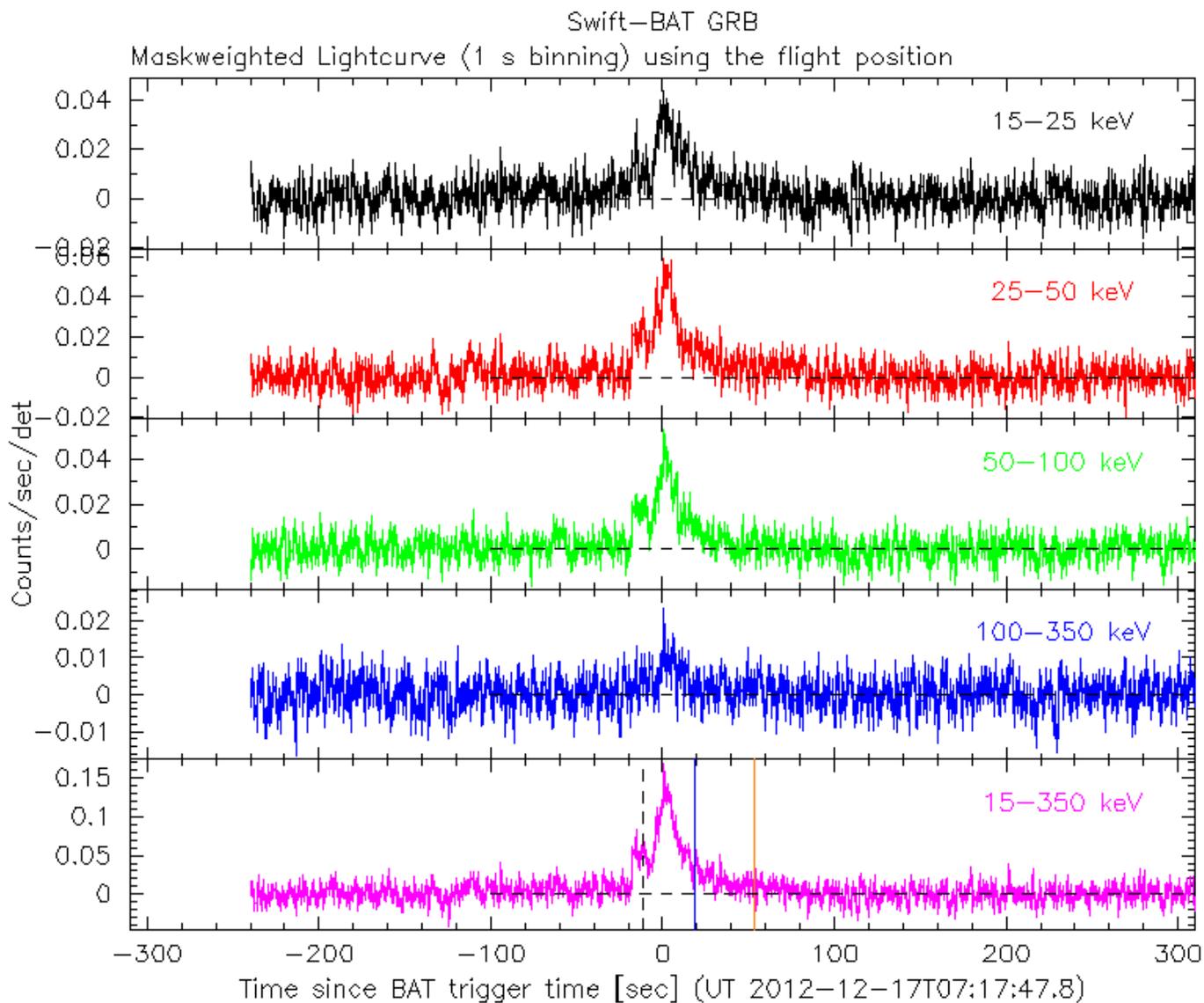


Figure 1. The BAT mask-weighted light curve in the four individual and total energy bands. The units are counts s^{-1} illuminated-detector $^{-1}$.

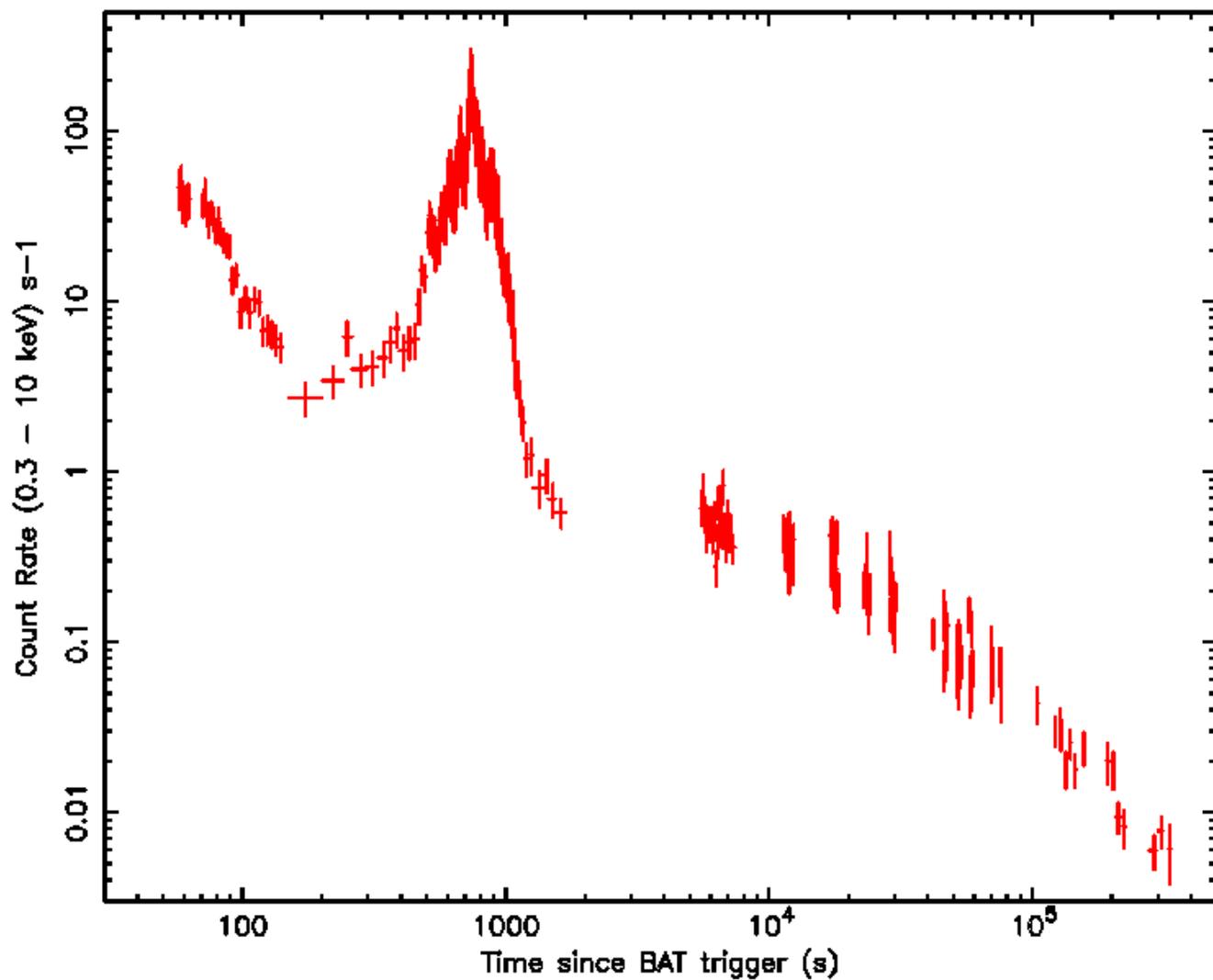


Figure 2. The XRT light curve.

RA	Dec	Error	Note	Reference
10 ^h 14 ^m 50.32 ^s	-62°21' 03.3"	0.6"	UVOT-refined	Oates and Siegel GCN Circ. 14092
10 ^h 14 ^m 50.40 ^s	-62°21' 01.7"	1.7"	XRT-enhanced	Evans <i>et al.</i> GCN Circ. 14090
10 ^h 14 ^m 50.0 ^s	-62°21' 15.5"	1.0'	BAT-refined	Cummings <i>et al.</i> GCN Circ. 14096

Table 1. Positions from the Swift instruments.

Band	Authors	GCN Circ.	Observatory	Notes
Optical	Elliott <i>et al.</i>	14091	GROND	detection
Radio	Hancock <i>et al.</i>	14097	ATCA	upper limits
Gamma-ray	Yu and Gruber	14094	Fermi GBM	detection

Table 2. Summary of GCN Circulars from other observatories sorted by band and then circular number.

Filter	T _{start} (s)	T _{stop} (s)	Exp(s)	Mag
white	73	222	147	19.58 ± 0.13
v	616	5906	313	19.01 ± 0.22
b	541	560	19	18.76 ± 0.36
u	285	6522	540	20.09 ± 0.34
w1	666	6317	313	>19.96
m2	641	6112	313	>19.85
w2	591	7138	510	>20.37

Table 3. UVOT Observations. The start and stop times of the exposures are given in seconds since the BAT trigger. The preliminary detections and 3- σ upper limits are given. No correction has been made for extinction in the Milky Way.

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